

# PROGRAM facts

U.S. DEPARTMENT OF ENERGY  
OFFICE OF FOSSIL ENERGY  
NATIONAL ENERGY TECHNOLOGY LABORATORY

Strategic Center  
for Natural Gas & Oil

08/2006



## DOE's Deep Trek Program—Bringing New Gas to Market

### The Prize

- Onshore Deep Gas (>15,000 feet) technically recoverable resource estimates are between 114 and 132 trillion cubic feet (Tcf). Ref: *United States Geological Survey (USGS) and Potential Gas Committee (PGC)*.
- Offshore, Shallow Water Deep Gas technically recoverable resource estimate is up to 55 Tcf. Ref: *Mineral Management Service (MMS)*.
- Delivering 2 percent of this resource to market represents a 17 percent increase in U.S. natural gas supply.

### CONTACT

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### The Problem

- Of the 40,000+ wells drilled annually in the U.S., less than 2 percent are targeted for Deep Gas resources.
- Deep Gas wells encounter extreme pressures and temperatures, caustic and corrosive gases, and hard rocks.
- Many tools and technologies used in conventional oil and gas exploration and production do not function or fail at these conditions.
- Due to the small market size, industry R&D is negligible.

### The Solution

- DOE's Deep Trek Program was established in FY 2002 following an industry/academia/government roadmap in March 2001.
- The approach is to develop an entire exploration and production system that will allow economic recovery of natural gas from high-temp/high pressure formations while protecting the environment. Due to funding limitations, critical path technologies such as high temperature electronics are being developed first.
- The program currently involves 23 research organizations including Universities, small businesses, national labs, etc.
- The program has brought together the traditional oil and gas industry with the various industry segments and technologies from outside of oil and gas (DOD, aerospace, geothermal) to solve critical problems.

### Successes

#### Resource Assessments

- NETL has completed detailed resource assessments of the Greater Green River, Wind River, Uinta and Anadarko basins.
- West Virginia University Research Corporation has completed a geologic playbook and assessment of the Black-River/Trenton in the Appalachian basin and the University of Alabama is completing an assessment of the Gulf Coast Interior basins.



## Exploration Technologies

- Paulsson Geophysical has completed development of an advanced tool capable of running to 25,000 feet that provides 2-5 times the resolution of previous tools.
- RSI and 3DGEO have advanced the algorithms and equations necessary to improve imaging and predict rock and fluid properties in deep formations.

## High Temperature Electronics

- Honeywell has completed development of two chips with life expectancy of 5 years of continuous operation at 225 °C, with two additional chips expected in 2007 that will serve as the building blocks for most downhole sensors and tools. One chip has been successfully tested to 300 °C for over 1,000 continuous hours.

## Drilling & Completion Technologies

- APS Technologies has developed a field prototype drilling vibration monitoring and control system to optimize rate of penetration and extend downhole tool life.
- Schlumberger has developed a field prototype measurement-while-drilling (MWD) tool that will improve drilling efficiency through improved downhole measurement of critical drilling data.
- GE has grown a new crystal that will be used in an advanced gamma detection tool to improve downhole measurements of formations.
- Technology International has developed an improved cutter that a major bit company is incorporating into their drill bits for hard rock drilling at deep depths.
- Grant Prideco/Novatek has commercialized a revolutionary drill pipe (Intellipipe) that provides 100,000 times faster communications between surface and downhole instrumentation. It is anticipated that this capability will augment ultra deep data transmission.

**Deep Trek Program**

- Expand America's economically-recoverable deep (+20,000') gas resource by 30 TCF by 2015.
- Develop technologies that will:
  - Operate in high temperature & pressure environments (HT/HP)
  - Reduce drilling costs
- Projects under development for an integrated system:

NETL

Supercement that will provide long-term integrity in the HT/HP environment of deep gas operations.

HT MWD tool to provide critical drilling information.

Drilling Vibration sub tool to control and reduce vibration impact on downhole tools and increase ROP.

Digital SOI CMOS

ASICs & Memories

Mixed Mode

Sensors

Hi Temp Electronics

Integrated Hi Temp Sensor Systems

System on a Chip

HT/HP electronics and Gamma Ray detector for LWD, MWD, formation evaluation tools, and other Downhole components which are the building blocks for the essential development of deep gas resources.

HT Downhole Microcomputer System

Electro-Magnetic telemetry tool to facilitate transmission of MWD data in deep, HT/HP environments.

Downhole generator to provide power to equipment at the bottom of the hole.

Drill bits and drilling fluids that will increase rate of penetration (ROP) and operate in HT/HP environments.

Study to understand current reservoir stimulation in deep environments and future technology needs.